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(54) **AIR OUTPUT ASSEMBLY, OUTDOOR UNIT AND AIR CONDITIONER**

(57) An air outlet assembly, an outdoor unit (100) and an air conditioner. The air outlet assembly includes a panel body (10) and a guide ring (20). The panel body (10) is provided with an air outlet (11). The guide ring (20) is provided at the panel body (10) and includes a main air ring (21) and an air diffuser (22). The main air ring (21) is coaxial with the air outlet (11). The air diffuser (22) is located at the air outlet side of the main air ring (21), one end is connected to the main air ring (21) and the other end extends in a direction away from the main air ring (21), to diffuse the outlet airflow along the air diffuser (22).

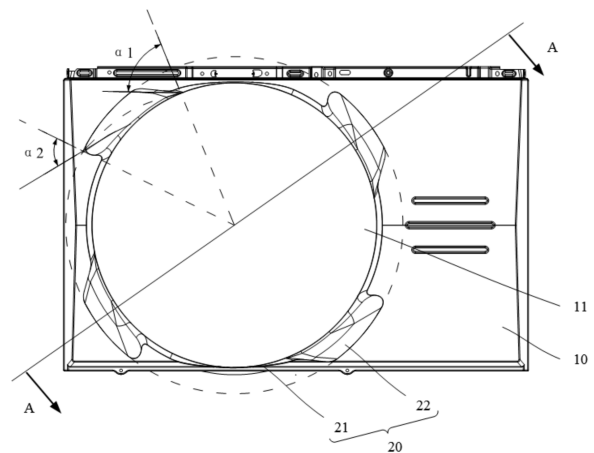


FIG. 1

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Description

[0001] The present application claims priority to Chinese Patent Application No. 202310884723.1, filed on July 18, 2023, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present application relates to the technical field of air conditioners, and in particular to an air outlet assembly, an outdoor unit and an air conditioner.

BACKGROUND

[0003] The noise from the outdoor unit mainly originates from the air duct, which is primarily related to the structural design of the guide ring.

[0004] In the current outdoor units, a guide ring is provided at the air outlet to guide the airflow generated by the fan to the external environment. However, as the airflow passes through the guide ring towards the external environment, vortices are easily generated at the inner wall of the guide ring, resulting in vortex noise and a loss of airflow.

SUMMARY

[0005] The main purpose of the present application is to provide an air outlet assembly designed to increase airflow and reduce noise.

[0006] To achieve the above objective, the air outlet assembly proposed in the present application comprises:

a panel body provided with an air outlet; and

a guide ring provided at the panel body and comprising a main air ring and an air diffuser, the main air ring is coaxial with the air outlet, the air diffuser is located at an air outlet side of the main air ring, an end of the air diffuser is connected to the main air ring, and an other end of the air diffuser extends in a direction away from the main air ring, to diffuse outlet airflow along the air diffuser.

[0007] In an embodiment, a plurality of air diffusers are provided at an interval around an axis of the main air ring.

[0008] In an embodiment, the air diffuser is configured as a spiral groove recessed into a surface of the panel body.

[0009] In an embodiment, a contour line of the spiral groove forms a partial arc segment of a spiral and satisfies following equations: $x=k*\cos\gamma/y$, $y=k*\sin\gamma/y$, k denotes a constant, and γ denotes a polar angle.

[0010] In an embodiment, the spiral groove comprises a first extension section and a second extension section connected to the first extension section, an initial angle α_1 between an extension direction of the first extension section and an extension direction of an inner diameter of the main air ring is less than a terminal angle α_2 between an extension direction of the second extension section and an extension direction of an inner diameter of the main air ring.

[0011] In an embodiment, a difference between the initial angle α_1 and the terminal angle α_2 satisfies: $10^\circ < \alpha_2 - \alpha_1 < 40^\circ$.

[0012] In an embodiment, the initial angle α_1 is greater than 25° .

[0013] In an embodiment, α_1 is equal to 35° .

[0014] In an embodiment, the terminal angle α_2 is greater than 50° .

[0015] In an embodiment, α_2 is equal to 70° .

[0016] In an embodiment, a first contour line formed by a first cross-section along a central axis of the main air ring intersecting the air diffuser is an arc protruding away from the central axis of the main air ring, the arc has an air inlet end and an air outlet end, and an angle β_1 between a tangent at the air inlet end and the central axis is greater than an angle β_2 between a tangent at the air outlet end and the central axis.

[0017] In an embodiment, β_1 is greater than 20° and less than 60° ; and/or, β_2 is greater than 20° and less than 60° .

[0018] In an embodiment, the main air ring comprises an air inlet section, a connection section, and an air outlet section connected in sequence, an inner wall of the connection section is a cylindrical surface, an inner wall of the air outlet section is an arc surface curved outwardly, and the air diffuser is connected to the air outlet section.

[0019] In an embodiment, a thickness of the connection section is H_1 , and H_1 is greater than or equal to 25 mm and less than or equal to 60 mm;

and/or, a thickness of the air outlet section is H_2 , and H_2 is greater than or equal to 15 mm and less than or equal to 50 mm.

[0020] In an embodiment, the air outlet assembly further comprises an air outlet grille, the air outlet grille is provided at an air outlet end of the panel body and is provided with a main air outlet area corresponding to the main air ring, and an air diffusion area corresponding to the air diffuser, to follow an airflow direction of the outlet airflow.

[0021] In an embodiment, the air outlet grille comprises a center plate, a rib group, and an outer frame arranged

sequentially from inside to outside,

the rib group comprises a plurality of first radial ribs and a plurality of second radial ribs, the plurality of first radial ribs are arranged along a circumference along the center plate and form the air diffusion area, and the plurality of second radial ribs are arranged along the circumference of the center plate and form the main air outlet area, and inclination directions of the plurality of first radial ribs and inclination directions of the plurality of second radial ribs are arranged in accordance with the airflow direction.

[0022] In an embodiment, the first radial ribs forms a first inclination angle θ_1 with respect to a reference surface perpendicular to a center line of the center plate, the second radial ribs forms a second inclination angle θ_2 with respect to the reference surface, and θ_1 is less than or equal to θ_2 .

[0023] In an embodiment, θ_1 is greater than 45° , and less than 80° ; and/or, θ_2 is greater than 55° and less than 75° ; and/or, θ_1 is equal to 65° ; and/or, θ_2 is equal to 70° .

[0024] The present application further proposes an outdoor unit, comprising the air outlet assembly as described above.

[0025] The present application further proposes an air conditioner, comprising the outdoor unit as described above.

[0026] In the technical solution of the present application, the guide ring is provided with an air diffuser and is connected to the main air ring through the air diffuser. The free end of the guide ring extends in a direction away from the main air ring, so that the air diffuser serves as a diffusion channel to increase the air outlet area to a certain extent, and to guide at least a portion of the outlet airflow in the direction away from the main air ring. This helps to reduce the generation of vortices on the inner wall of the main air ring, reduce the loss of air volume and reduce vortex noise. Therefore, under the same air volume, it is possible to significantly reduce the noise in the axial direction of the main air ring and change the diffusion direction of the outlet airflow; and also increase the air volume under the same noise level.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] To more clearly illustrate the technical solutions in the embodiments of the present application or in the related art, the drawings used in the description of the embodiments or the related art will be briefly introduced below. Obviously, the drawings described below are only some embodiments of the present application. For those skilled in the art, other drawings can be obtained based on the structures shown in these drawings without creative effort.

FIG. 1 is a schematic structural view of a guide ring according to an embodiment of the present application.

FIG. 2 is a cross-sectional view at portion A in FIG. 1.

FIG. 3 is a schematic structural view of an air outlet grille.

FIG. 4 is a cross-sectional view at portion B in FIG. 3.

FIG. 5 is a cross-sectional view at portion C in FIG. 3.

FIG. 6 is an exploded view of an outdoor unit according to an embodiment of the present application.

FIG. 7 is a parameter comparison view between the outdoor unit according to an embodiment of the present application and the outdoor unit in the related art.

Description of reference signs:

[0028]

reference sign	name	reference sign	name
10	panel body	32	air diffusion area
11	air outlet	33	center plate
20	guide ring	34	rib group
21	main air ring	341	first radial rib
211	air inlet section	342	second radial rib
212	connection section	35	outer frame
213	air outlet section	100	outdoor unit

(continued)

reference sign	name	reference sign	name
22	air diffuser	101	housing
30	air outlet grille	102	fan
31	main air outlet area	103	heat exchanger

[0029] The realization of the purpose, functional features, and advantages of the present application will be further explained in conjunction with the embodiments and with reference to the accompanying drawings.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0030] The technical solutions of the embodiments of the present application will be clearly and completely described below with reference to the accompanying drawings. Obviously, the described embodiments are only some rather than all of the embodiments of the present application. Based on the embodiments of the present application, all other embodiments obtained by those skilled in the art without creative effort are within the scope of the present application.

[0031] In the present application, unless otherwise expressly specified and limited, the terms "connection," "fixation," etc., should be interpreted broadly. For example, "fixation" can be a fixed connection, a detachable connection, or formed integrally; it can be a mechanical connection or an electrical connection; it can be a direct connection or an indirect connection through an intermediate medium; or it can be the internal communication of two components or the interaction between two components, unless otherwise expressly limited. Those skilled in the art can understand the specific meaning of the above terms in the present application according to the specific circumstances.

[0032] It should be noted that if the embodiments of the present application involve directional indicators (such as up, down, left, right, front, back, etc.), the directional indicators are only used to explain the relative positional relationship and movement of each component in a certain specific posture (as shown in the figure). If the specific posture changes, the directional indicators will also change accordingly.

[0033] Furthermore, if the embodiments of the present application involve descriptions such as "first" or "second," such descriptions are for descriptive purposes only and should not be construed as indicating or implying their relative importance or implicitly specifying the number of technical features indicated. Thus, a feature defined with "first" or "second" may explicitly or implicitly comprise at least one of those features. Furthermore, the meaning of "and/or" throughout the text is to comprise three parallel solutions. Taking "A and/or B" as an example, it comprises solution A, solution B, or a solution that satisfies both A and B. Additionally, the technical solutions of the various embodiments can be combined with each other, but this must be based on the ability of a person skilled in the art to implement them. When the combination of technical solutions is contradictory or cannot be implemented, it should be considered that such a combination of technical solutions does not exist and is not within the scope of the present application.

[0034] The present application proposes an air outlet assembly.

[0035] Referring to FIGS. 1 to 6, in an embodiment of the present application, the air outlet assembly comprises a panel body 10 and a guide ring 20. The panel body 10 is provided with an air outlet 11. The guide ring 20 is provided at the panel body 10 and comprises a main air ring 21 and an air diffuser 22. The main air ring 21 is coaxial with the air outlet 11. The air diffuser 22 is located at the air outlet side of the main air ring 21, with one end connected to the main air ring 21 and the other end extending away from the main air ring 21, so that the airflow diffuses along the air diffuser 22. This allows for a significant reduction in noise levels at the same airflow rate, and an increase in airflow at the same noise level.

[0036] The main air ring 21 is provided around the air outlet 11 to facilitate the guidance of the airflow to the external environment. By providing the air diffuser 22 on the air outlet side of the main air ring 21, the air diffuser 22 is provided at the panel body 10. At this time, one end of the air diffuser 22 can be connected to the side wall of the main air ring 21 or to the periphery of the main air ring 21, and the other end of the air diffuser 22 extends away from the main air ring 21. In this way, the air outlet area of the guide ring 20 can be increased, the wind speed can be reduced, the static pressure can be increased, thereby stabilizing the airflow, increasing the air delivery distance, reducing noise, increasing the air volume, and improving the user experience.

[0037] Specifically, the free end of the air diffuser 22 extends away from the main air ring 21, which can serve as a diffusion channel, increasing the air outlet area to a certain extent, and guiding at least part of the outlet airflow away from the main air ring 21. This can reduce the generation of vortices on the inner wall of the main air ring 21, reduce the loss of air outlet volume and reduce vortex noise. Therefore, under the same air volume, the noise in the axial direction of the main air ring 21 can be significantly reduced, and the diffusion direction of the outlet airflow can be changed. Furthermore, it can increase the air outlet volume under the same noise level.

[0038] In the technical solution of the present application, the guide ring 20 is provided with the air diffuser 22, which is connected to the main air ring 21. The free end of the air diffuser 22 extends away from the main air ring 21, so that the air

diffuser 22 serves as a diffusion channel, which increases the air outlet area to a certain extent and can guide at least a portion of the outlet airflow away from the main air ring 21. This helps to reduce the generation of vortices on the inner wall of the main air ring 21, reduce the loss of air outlet volume, and reduce vortex noise. Therefore, under the same air volume, the noise in the axial direction of the main air ring 21 can be significantly reduced and the diffusion direction of the outlet airflow can be changed. Furthermore, it can increase the air outlet volume under the same noise level.

[0039] Referring to FIG. 1, in an embodiment, a plurality of air diffusers 22 are provided at an interval around the axis of the main air ring 21. In this way, by increasing the plurality of air diffuser 22, i.e. the plurality of diffusion channels, the air outlet area can be further increased while making reasonable use of the internal layout space of the outdoor unit 100 and avoiding internal parts. This also causes most of the outlet airflow to diffuse away from the main air ring 21, thereby significantly reducing noise in the axial direction of the main air ring 21 and reducing the loss of air outlet volume. This achieves a significant reduction in noise level at the same air volume, and an increase in air outlet volume at the same noise level. Two or more air diffuser 22 can be provided. As shown in FIG. 1, four air diffuser 22 are provided and correspond to the four corners of the panel body 10. This makes reasonable use of the arrangement space and can reliably avoid the internal parts of the outdoor unit 100, ensuring the normal air guiding of the air diffuser 22.

[0040] The plurality of air diffusers 22 are evenly spaced around the circumference of the main air ring 21, which allows the airflow from the main air ring 21 to be evenly dispersed, allowing the airflow to flow along each air diffuser 22 and diffuse into the external environment, effectively reducing localized concentration of airflow.

[0041] Specifically, in an embodiment, the air diffuser 22 is configured as a spiral groove recessed into the surface of the panel body 10. This helps to improve the smoothness of airflow. Furthermore, since the air diffuser 22 has a spiral structure, it can make the outlet airflow form a spiral airflow, thereby increasing the flow momentum, making it easier to push the other airflows to flow together, reducing airflow backflow, effectively increasing the air volume and reducing noise.

[0042] The connection between the air diffuser 22 and the main air ring 21 is smooth and continuous, which facilitates smoother airflow and reduces turbulence caused by uneven connection, thereby reducing noise and loss of air volume.

[0043] Furthermore, in an embodiment, the outline of the spiral groove forms a partial arc segment of a spiral and satisfies the following equations: $x=k*\cos\gamma/y$, $y=k*\sin\gamma/y$, where k denotes a constant, and γ denotes a polar angle.

[0044] Where x and y are the coordinates of any point on the spiral. By taking different values of x and y , the outline of the spiral groove is obtained. Since the outline forms arc segments at different positions on the spiral, the extension direction of the spiral groove can be changed, thereby changing the direction of the airflow. This is beneficial for improving the air volume and noise levels according to needs.

[0045] Referring to FIG. 1, in an embodiment, the spiral groove comprises a first extension section and a second extension section connected to the first extension section. The initial angle α_1 between the extension direction of the first extension section and the extension direction of the inner diameter of the main air ring 21 is smaller than the terminal angle α_2 between the extension direction of the second extension section and the extension direction of the inner diameter of the main air ring 21, thereby confirming the cut-in angle and cut-out angle of the airflow and improving the air outlet effect.

[0046] Specifically, one end of the first extension section smoothly transitions to the main air ring 21, and the other end of the first extension section smoothly transitions to the second extension section. One end of the second extension section away from the second extension section smoothly transitions to the surface of the panel body 10. This ensures smooth airflow and ensures that the airflow flows along a relatively smooth and continuous surface during the flow process, reducing turbulence and noise generation and improving the air outlet effect.

[0047] The first and second extension sections are connected to form a spiral groove. Both the outlines of the first and second extension sections are curves, and when connected, they can form a spiral outline. Since the first extension section has an initial angle α_1 with respect to the extension direction of the inner diameter of the main wind ring 21, and the second extension section has a terminal angle α_2 with respect to the extension direction of the inner diameter of the main wind ring 21, where α_1 is less than α_2 , That is, the airflow from the main air ring 21 flows to the first extension section and diffuses along the included angle α_1 to the second extension section. After flowing into the second extension section, it diffuses to the external environment along the included angle α_2 . By setting α_2 to be greater than α_1 and the smooth connection between the main air ring 21, the first extension section, the second extension section and the panel body 10, the air outlet area is increased step by step, and the air volume is effectively increased, noise is reduced and the air outlet direction is changed.

[0048] Furthermore, in an embodiment, the difference between the initial angle α_1 and the terminal angle α_2 satisfies: $10^\circ < \alpha_2 - \alpha_1 < 40^\circ$. Specifically, when $\alpha_2 - \alpha_1 < 10^\circ$, since the difference between the initial angle and the terminal angle is too small, it is impossible to obtain a large air outlet area on the limited panel body 10, and it is also impossible to significantly change the diffusion direction of the outlet airflow, which easily leads to turbulence, thereby affecting the increase of air outlet volume and the reduction of noise in the axial direction of the main air ring 21. When $\alpha_2 - \alpha_1 > 40^\circ$, since the difference between the initial angle and the terminal angle is too large, the outlet airflow can easily diffuse excessively in the second extension section, causing the outlet airflow to diverge, affecting the air delivery distance and increasing the air volume. Therefore, by setting the difference between the initial angle α_1 and the terminal angle α_2 between 10° and 40° , a larger air outlet area can be obtained on the limited panel body 10. Simultaneously, the flow direction of the outlet airflow

can be reliably changed to ensure stable diffusion of the outlet airflow, reducing the decrease in air volume and the increase in noise caused by turbulence, and also guaranteeing the air delivery distance.

[0049] The difference between the initial angle α_1 and the terminal angle α_2 can be 15° , 20° , 25° , 30° , 35° , etc., which is not limited here.

[0050] Specifically, in an embodiment, the initial angle α_1 is greater than 25° , which reliably changes the airflow direction of the outlet airflow from the main air ring 21. Simultaneously, it avoids an excessively small initial angle (α_1 is less than 25°), which could cause a sudden change in the airflow direction as the outlet airflow enters the air diffuser 22. This ensures that the outlet airflow flows into the air diffuser 22 relatively smoothly, effectively reducing turbulence and noise generation. The specific value of the initial angle α_1 can be 30° , 35° , 40° , 45° , 50° , etc., and is not limited here.

[0051] More specifically, in an embodiment, α_1 is equal to 35° , which facilitates guiding most of the outlet airflow to the air diffuser 22, and the outlet airflow flows relatively smoothly.

[0052] Specifically, in an embodiment, the terminal angle α_2 is greater than 50° , which reliably changes the airflow direction of the outlet airflow from the air diffuser 22. Simultaneously, it avoids an excessively small terminal angle (α_2 is less than 50°), which would result in a small air outlet area, an unclear diffusion direction, and potentially affect the air delivery distance. This ensures a larger air outlet area and a more pronounced diffusion direction, thereby effectively reducing turbulence and noise along the axis of the main airflow ring 21. The specific value of the terminal angle α_2 can be 55° , 60° , 65° , 70° , etc., and is not limited here.

[0053] More specifically, in an embodiment, α_2 is equal to 70° , which facilitates guiding the outlet airflow to the external environment and maintaining a high air volume, thereby reducing noise in the axial direction of the main air ring 21.

[0054] Referring to FIG. 2, in an embodiment, the first contour line formed by the first cross-section along the central axis of the main air ring 21 intersecting the air diffuser 22 is an arc protruding away from the central axis of the main air ring 21. The arc has an air inlet end and an air outlet end, and an angle β_1 between a tangent at the air inlet end and the central axis is greater than an angle β_2 between a tangent at the air outlet end and the central axis.

[0055] Specifically, the first contour line is an arc protruding away from the central axis of the main air ring 21. On the one hand, it can make the outlet airflow flow along a relatively smooth and continuous surface during the flow process, reducing the generation of turbulence and noise. On the other hand, by setting the air inlet angle at the air inlet end and the air outlet angle at the air outlet end of the first contour line, i.e., defining β_2 is less than β_1 , the airflow is effectively guided into the air diffuser 22. At the same time, the diffusion direction of the outlet airflow is limited to ensure the stable diffusion of the outlet airflow, thereby increasing the air volume, reducing noise, and improving the air delivery distance.

[0056] Furthermore, in an embodiment, the angle β_1 between the tangent at the air inlet and the central axis satisfies the condition: β_1 is greater than 20° and less than 60° , that is, the specific value of the angle β_1 can be 25° , 30° , 35° , 40° , 45° , 50° , 55° , etc.; and/or, the angle β_2 between the tangent at the air outlet end and the central axis satisfies the condition: β_2 is greater than 20° and less than 60° , that is, the specific value of the angle β_2 can be 25° , 30° , 35° , 40° , 45° , 50° , 55° , etc. The limitation of β_2 less than β_1 is more conducive to improving the air outlet effect.

[0057] Referring to FIG. 2, in an embodiment, the main air ring 21 comprises an air inlet section 211, a connection section 212, and an air outlet section 213 connected in sequence. The inner wall of the connection section 212 is a cylindrical surface, and the inner wall of the air outlet section 213 is an arc surface curved outwardly. The air diffuser 22 is connected to the air outlet section 213. Thus, the airflow enters the connection section 212 from the air inlet section 211. Since the inner wall of the connection section 212 is a cylindrical surface, it can better gather the airflow flowing in from the air inlet section 211 and guide the gathered airflow to the air outlet section 213. Each air diffuser 22 is partially connected to the air outlet section 213. Furthermore, the inner wall of the air outlet section 213 is an arc surface curved outwardly. On the one hand, this allows for a smoother transition between the air diffuser 22 and the air outlet section 213 to ensure the smooth and stable flow of the airflow to the air diffuser 22, and to expand the air outlet area and reliably guide the diffusion of airflow. On the other hand, it effectively changes the flow direction of airflow through the air outlet section 213. This configuration effectively reduces noise along the axis of the main air ring 21 to a certain extent and increases the air volume.

[0058] In addition, the inner wall of the air inlet section 211 is an arc surface curved outwardly, to better gather the generated airflow and increase the air volume.

[0059] Specifically, in an embodiment, a thickness of the connection section 212 is H_1 , where H_1 is greater than or equal to 25 mm and less than or equal to 60 mm. By reasonably setting a height of the connection section 212 in the axis of the main air ring 21, the gathering and guiding effect of the connection section 212 on the airflow can be ensured. This reduces the generation of vortices on the inner wall of the main air ring 21, reduces the loss of air volume, and lowers noise. The specific value of the thickness H_1 of the connection section 212 can be 25 mm, 30 mm, 35 mm, 40 mm, 45 mm, 50 mm, 55 mm, 60 mm, etc., and is not limited here.

[0060] Specifically, in an embodiment, the thickness of the air outlet section 213 is H_2 , where H_2 is greater than or equal to 15 mm and less than or equal to 50 mm. By reasonably setting the height of the air outlet section 213 along the axis of the main air ring 21, the height of the air diffuser 22 on the panel body 10 along the axis of the main air ring 21, as well as the initial angle and terminal angle of the air diffuser 22, can be further set. This allows for a reasonable setting of the extension direction and diffusion direction of the air diffuser 22, ensuring an increase in air volume and a reduction in noise. The

specific value of the thickness H2 of the air outlet section 213 can be 15 mm, 20 mm, 25 mm, 30 mm, 35 mm, 40 mm, 45 mm, 50 mm, etc., and is not limited here.

[0061] To further improve the air volume and air outlet effect, referring to FIGS. 3 to 6, in an embodiment, the air outlet assembly further comprises an air outlet grille 30. The air outlet grille 30 is provided at the air outlet end of the panel body 10.

The air outlet grille 30 has a main air outlet area 31 corresponding to the main air ring 21 and an air diffusion area 32 corresponding to the air diffuser 22, to conform to the airflow direction of the outlet airflow, thereby effectively reducing the possibility of airflow impacting the air outlet grille 30, effectively improving the air volume and reducing noise.

[0062] The air outlet grille 30 and the panel body 10 can be an integral structure or a separate structure. The main air outlet area 31 on the air outlet cover corresponds to the main air ring 21, to follow the airflow direction from the main air ring 21 to the air outlet grille 30. The air diffuser 22 corresponds to the air diffusion area 32 to follow the airflow direction from the air diffuser 22 to the air outlet grille 30. With the combination of two, it is beneficial to reduce resistance, prevent the airflow from impacting the air outlet grille 30, effectively reduce airflow loss and turbulence generation, and thus improve the air volume and reduce noise to a certain extent. Meanwhile, the air outlet grille 30 can also protect the outdoor unit 100, preventing foreign objects from entering the outdoor unit 100 and affecting the normal operation of the air conditioner outdoor unit 100.

[0063] Referring to FIG. 3, in an embodiment, the air outlet grille 30 comprises a center plate 33, a rib group 34, and an outer frame 35 arranged sequentially from the inside to the outside. The rib group 34 comprises a plurality of first radial ribs 341 and a plurality of second radial ribs 342. The plurality of first radial ribs 341 are arranged along the circumference of the center plate 33 and form the air diffusion area 32. The plurality of second radial ribs 342 are arranged along the circumference of the center plate 33 and form the main air outlet area 31. The inclination directions of the first radial ribs 341 and the second radial ribs 342 are both set in accordance with the airflow direction. It can be understood that, the first radial rib 341 is inclined along its extension direction to follow the airflow direction from the air diffuser 22 to the air diffusion area 32, and the second radial rib 342 is inclined along its extension direction to follow the airflow direction from the main air ring 21 to the main air outlet area 31. In this way, the obstruction to the airflow and the generation of turbulence can be effectively reduced, which facilitates the increase of air volume and the reduction of noise.

[0064] Specifically, each first radial rib 341 can be provided on the outside of each second radial rib 342. Alternatively, by replacing the second radial rib 342 corresponding to the air diffuser 22, the radial ribs corresponding to the air diffuser 22 can all be first radial ribs 341. In this way, by following the airflow direction, the resistance to the airflow is reduced, the possibility of turbulence generation is reduced, thereby increasing the air volume and reducing noise.

[0065] In addition, the air outlet grille 30 also comprises a plurality of annular ribs, which are spaced apart and nested in sequence and are concentrically arranged with the center plate 33. The annular ribs are located between the center plate 33 and the outer frame 35, and intersect and connect with the first radial rib 341 and the second radial rib 342 to enhance the structural strength and structural stability of the air outlet grille 30.

[0066] Referring to FIGS. 3 to 5, in an embodiment, the first radial rib 341 forms a first inclination angle θ_1 with the reference surface, and the second radial rib 342 forms a second inclination angle θ_2 with the reference surface, where θ_1 is less than or equal to θ_2 . The reference surface is perpendicular to the center line of the center plate 33. By setting θ_1 less than or equal to θ_2 , the outlet airflow passing through the main air ring 21 flows over the second radial ribs 342 and then flows towards the external environment, while the airflow passing through the air diffuser 22 flows over the first radial rib 341 and then flows towards the external environment, which increases the air outlet area to a certain extent, avoids excessive airflow dissipation and loss. This ensures stable airflow diffusion, which is conducive to increasing the air volume, reducing noise, and also facilitates increasing the air delivery distance.

[0067] Referring to FIG. 4, in an embodiment, θ_1 is greater than 45° and less than 80° , which reliably follows the flow direction of the airflow flowing towards the air outlet grille 30 under the action of the air diffuser 22. When θ_1 is greater than 80° or less than 45° , the airflow is prone to impact with the first radial rib 341, resulting in airflow loss and turbulence. Therefore, by setting θ_1 between 45° and 80° , it is beneficial to reduce resistance, prevent the outlet airflow from impacting the first radial rib 341, effectively reduce airflow loss and turbulence generation, thereby increasing the air volume and reduce noise to a certain extent. Specifically, the specific value of the first inclination angle θ_1 can be 45° , 50° , 55° , 60° , 65° , 70° , 75° , 80° , etc., and is not limited here.

[0068] Referring to FIG. 5, in an embodiment, θ_2 is greater than 55° and less than 75° , which reliably follows the flow direction of the airflow towards the air outlet grille 30 under the action of the main air ring 21. When θ_2 is greater than 75° or less than 55° , the airflow is prone to impact on the second radial rib 342, resulting in airflow loss and turbulence. Therefore, by setting θ_2 between 55° and 75° , it is beneficial to reduce resistance, prevent the airflow from impacting the first and second radial ribs, and effectively reduce airflow loss and turbulence, thereby increasing the air volume and reduce noise to a certain extent. Specifically, the specific value of the second inclination angle θ_2 can be 55° , 60° , 65° , 70° , 75° , etc., and is not limited here.

[0069] More specifically, in an embodiment, θ_1 is equal to 65° , which facilitates guiding most of the airflow through the first radial rib 341 and ensures a relatively smooth airflow. In an embodiment, θ_2 is equal to 70° , which facilitates guiding most of the airflow through the second radial rib 342 and ensures a relatively smooth airflow.

[0070] The present application also proposes an outdoor unit 100, which comprises an air outlet assembly. The specific structure of the air outlet assembly refers to the above embodiments. Since this outdoor unit 100 adopts all the technical solutions of all the above embodiments, it has at least all the beneficial effects brought about by the technical solutions of the above embodiments, and will not be repeated here.

[0071] The air conditioner outdoor unit may comprise a housing 101, a fan 102, a heat exchanger 103, and the air outlet assembly described in the above technical solutions. The fan 102 and the heat exchanger 103 are provided inside the housing 101. The housing 101 is provided with an air outlet 11, and the air outlet assembly is provided at the air outlet 11 and is opposite to the fan 102.

[0072] As shown in FIG. 7, based on the combined arrangement of the aforementioned guide ring 20 and the air outlet grille 30, performance verification shows that, compared with existing outdoor units, it is possible to reduce noise by 1.9 decibels under the same air volume, and increase the air volume by 160 cubic meters under the same noise level, such as 52 decibels. Thus, the air outlet assembly of the present application can effectively improve the air outlet effect, increase the air volume, and reduce noise.

[0073] The present application also proposes an air conditioner, which comprises an outdoor unit 100. The specific structure of the outdoor unit 100 refers to the above embodiments. Since this air conditioner adopts all the technical solutions of all the above embodiments, it has at least all the beneficial effects brought about by the technical solutions of the above embodiments, which will not be repeated here.

[0074] The above description are only some embodiments of the present application and do not limit the scope of the present application. Under the inventive concept of the present application, any equivalent structural transformations made using the contents of the specification and drawings of the present application, or direct/indirect applications in other related technical fields, are comprised within the scope of the present application.

Claims

1. An air outlet assembly, comprising:

a panel body provided with an air outlet; and
a guide ring provided at the panel body, wherein the guide ring comprises:

a main air ring disposed coaxially with the air outlet; and
an air diffuser located at an air outlet side of the main air ring, an end of the air diffuser being connected to the main air ring, and an other end of the air diffuser extending in a direction away from the main air ring, to diffuse outlet airflow along the air diffuser.

2. The air outlet assembly according to claim 1, wherein a plurality of air diffusers are provided at an interval around an axis of the main air ring.

3. The air outlet assembly according to claim 1, wherein the air diffuser is configured as a spiral groove recessed into a surface of the panel body.

4. The air outlet assembly according to claim 3, wherein a contour line of the spiral groove forms a partial arc segment of a spiral and satisfies following equations: $x=k*\cos\gamma/y$, $y=k*\sin\gamma/\gamma$, where k denotes a constant, and γ denotes a polar angle.

5. The air outlet assembly according to claim 3, wherein the spiral groove comprises a first extension section and a second extension section connected to the first extension section, an initial angle α_1 between an extension direction of the first extension section and an extension direction of an inner diameter of the main air ring is less than a terminal angle α_2 between an extension direction of the second extension section and the extension direction of the inner diameter of the main air ring.

6. The air outlet assembly according to claim 5, wherein a difference between the initial angle α_1 and the terminal angle α_2 satisfies: $10^\circ < \alpha_2 - \alpha_1 < 40^\circ$.

7. The air outlet assembly according to claim 6, wherein the initial angle α_1 is greater than 25° .

8. The air outlet assembly according to claim 7, wherein α_1 is equal to 35° .

9. The air outlet assembly according to claim 5, wherein the terminal angle α_2 is greater than 50° .

10. The air outlet assembly according to claim 9, wherein α_2 is equal to 70° .

11. The air outlet assembly according to claim 1, wherein a first contour line formed by a first cross-section along a central axis of the main air ring intersecting the air diffuser is an arc protruding away from the central axis of the main air ring, the arc having an air inlet end and an air outlet end, and an angle β_1 between a tangent at the air inlet end and the central axis being greater than an angle β_2 between a tangent at the air outlet end and the central axis.

12. The air outlet assembly according to claim 11, wherein β_1 is greater than 20° and less than 60° ; and/or, β_2 is greater than 20° and less than 60° .

13. The air outlet assembly according to claim 1, wherein the main air ring comprises an air inlet section, a connection section, and an air outlet section connected in sequence, an inner wall of the connection section being a cylindrical surface, an inner wall of the air outlet section being an arc surface curved outwardly, and the air diffuser being connected to the air outlet section.

14. The air outlet assembly according to claim 13, wherein a thickness of the connection section is H_1 , and H_1 is greater than or equal to 25 mm and less than or equal to 60 mm; and/or, a thickness of the air outlet section is H_2 , and H_2 is greater than or equal to 15 mm and less than or equal to 50 mm.

15. The air outlet assembly according to claim 1, further comprising:
an air outlet grille provided at an air outlet end of the panel body, the air outlet grille being provided with a main air outlet area corresponding to the main air ring and an air diffusion area corresponding to the air diffuser, to follow an airflow direction of the outlet airflow.

16. The air outlet assembly according to claim 15, wherein:

the air outlet grille comprises a center plate, a rib group, and an outer frame arranged sequentially from inside to outside;

the rib group comprises a plurality of first radial ribs and a plurality of second radial ribs, the plurality of first radial ribs being arranged along a circumference of the center plate and forming the air diffusion area, and the plurality of second radial ribs being arranged along the circumference of the center plate and forming the main air outlet area and

inclination directions of the plurality of first radial ribs and inclination directions of the plurality of second radial ribs are arranged in accordance with the airflow direction.

17. The air outlet assembly according to claim 16, wherein the first radial ribs forms a first inclination angle θ_1 with respect to a reference surface perpendicular to a center line of the center plate, the second radial ribs forms a second inclination angle θ_2 with respect to the reference surface, and θ_1 is less than or equal to θ_2 .

18. The air outlet assembly according to claim 17, wherein:

θ_1 is greater than 45° and less than 80° ; and/or

θ_2 is greater than 55° and less than 75° ; and/or

θ_1 is equal to 65° ; and/or

θ_2 is equal to 70° .

19. An outdoor unit, comprising an air outlet assembly according to any one of claims 1 to 18.

20. An air conditioner, comprising an outdoor unit according to claim 19.

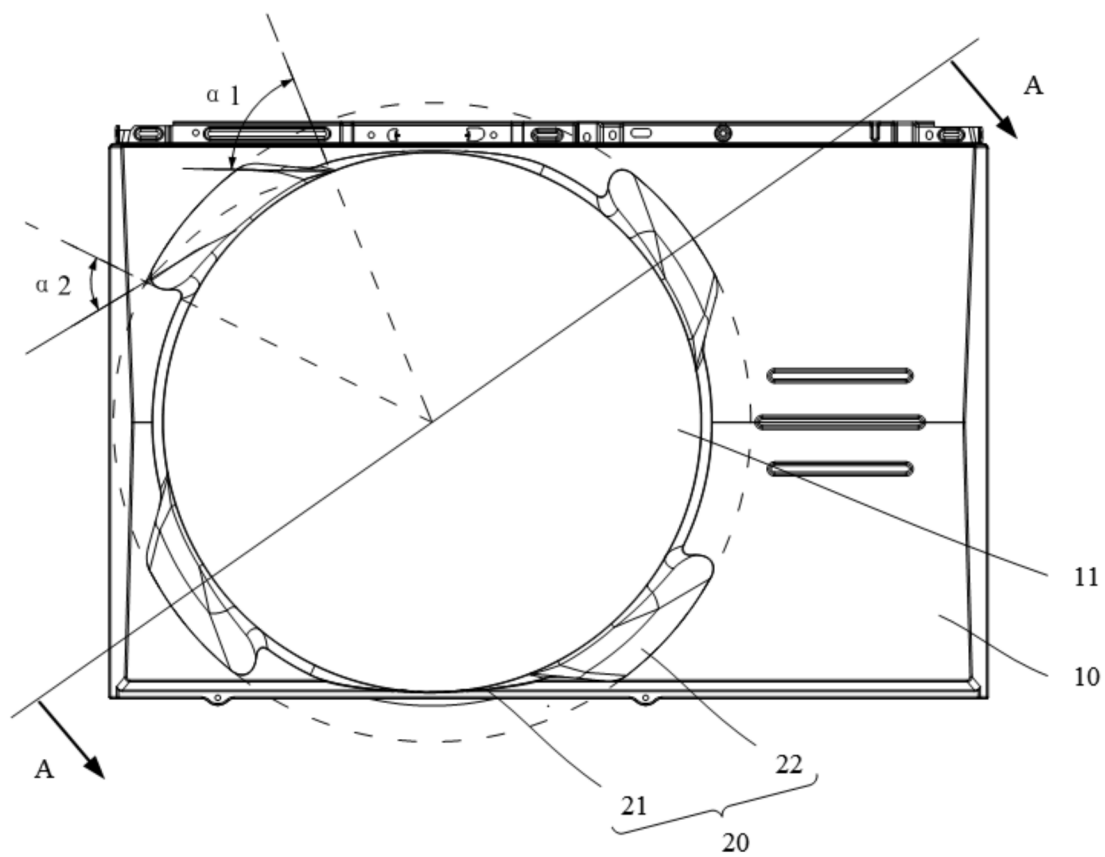


FIG. 1

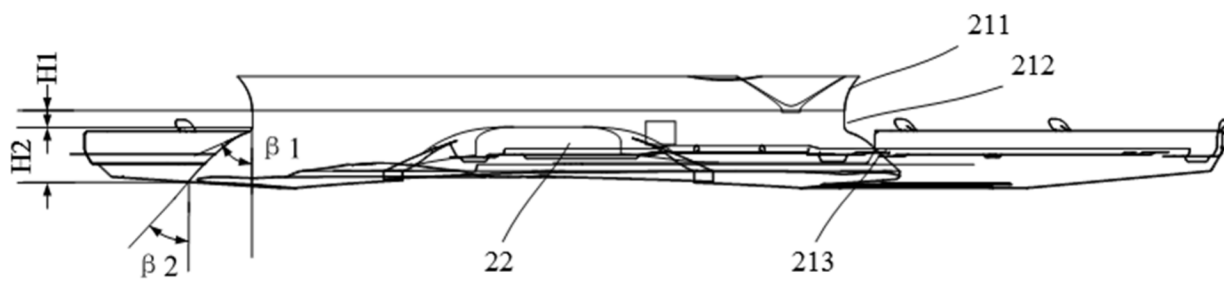


FIG. 2

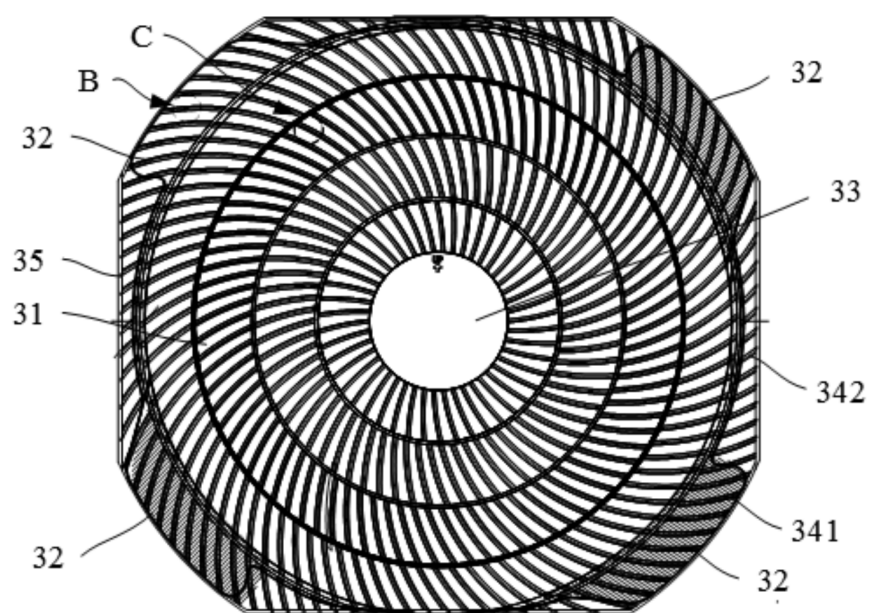


FIG. 3

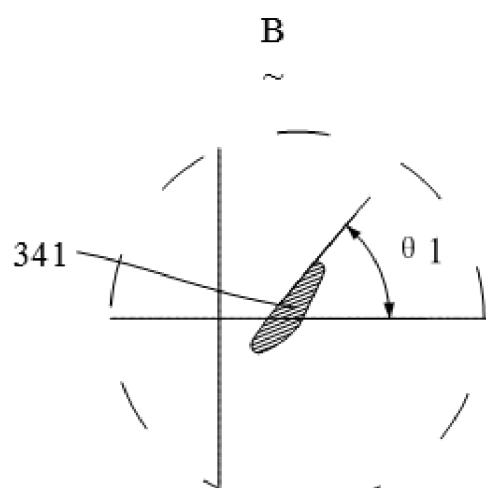


FIG. 4

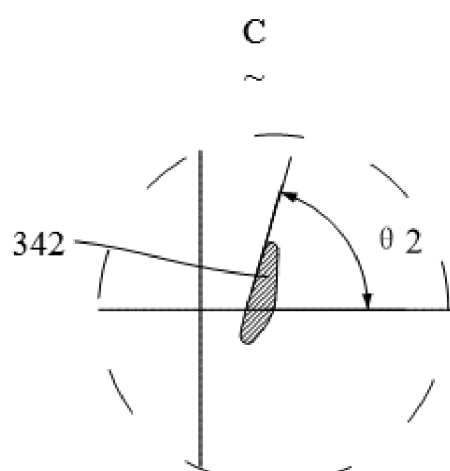


FIG. 5

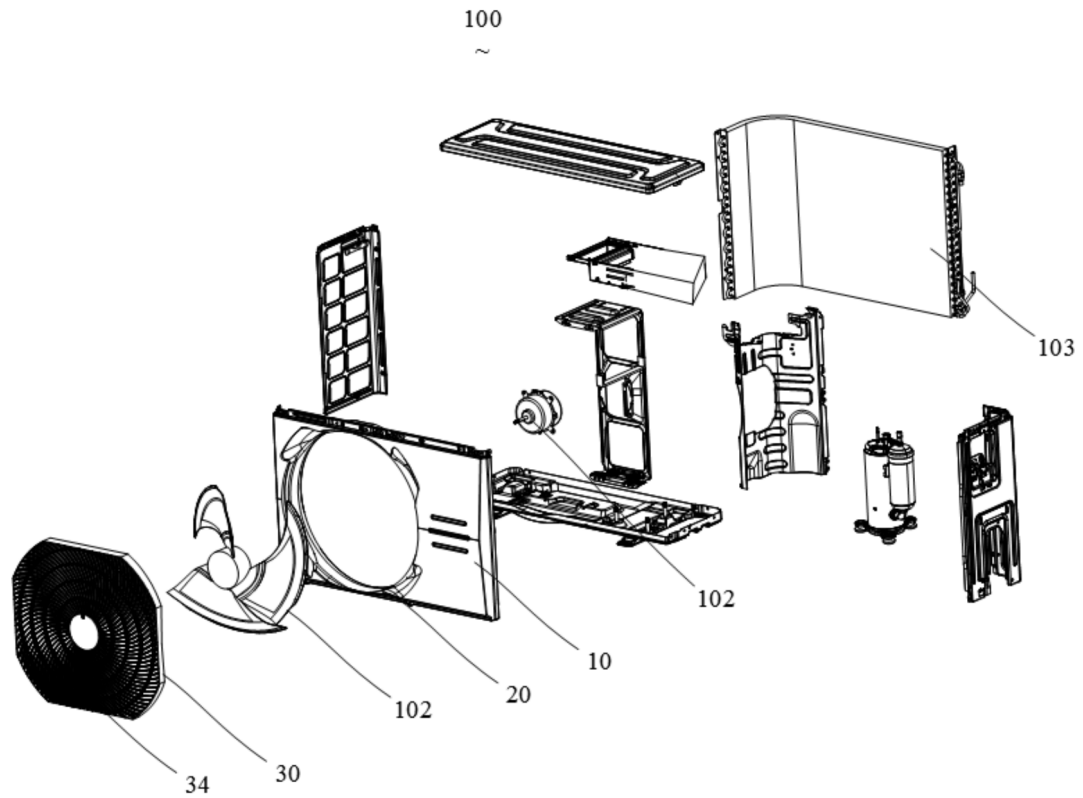


FIG. 6

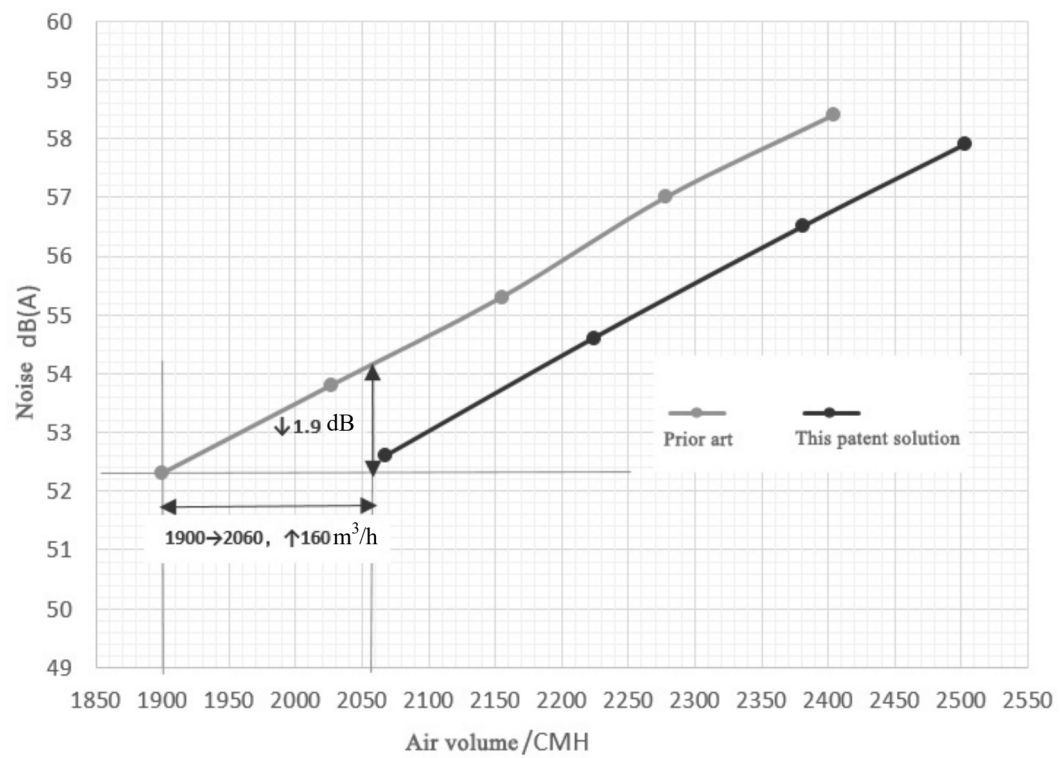


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/105798

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/40(2011.01)i; F24F1/48(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F24F1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXTC, VEN, CNKI: 外机, 扩风, 扩流, 扩散, 喇叭, 导流圈, 风圈, 减噪, 降噪, 消声, 消音, 消噪, 噪声, 噪音, 流量, 格栅, 网罩, 螺旋, 槽, 斜角, 倾角, 夹角, 角度, 筋条, 经条, 区, flar+, diffus+, expand+, cover, spiral, groove, guid+, ring, noise

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Y	US 2018224135 A1 (MITSUBISHI ELECTRIC CORP.) 09 August 2018 (2018-08-09) description, paragraphs 27-68, and figures 1-7	15-18
X	WO 2018093115 A1 (SAMSUNG ELECTRONICS CO., LTD.) 24 May 2018 (2018-05-24) description, paragraphs 43-74, and figures 1-11	1, 13-14, 19-20
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

29 September 2024

Date of mailing of the international search report

15 October 2024

Name and mailing address of the ISA/CN

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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/105798

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CN 106885316 A	23 June 2017	CN 106885316 B	11 October 2019

Form PCT/ISA/210 (patent family annex) (July 2022)

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